

Natural Resources

What Are Natural Resources?

Natural resources are useful materials from the Earth, such as coal, oil, natural gas, and trees. People depend on natural resources for basic survival and use them as raw materials to manufacture or create a range of modern conveniences. Water and food provide humans with sustenance and energy, for example, and fossil fuels generate heat as well as energy for transportation and industrial production. Many of the same natural resources used by people are important to plants and wildlife for survival as well.



Virgin Versus Recovered Resources

Resources used for the first time are considered virgin resources, and their extraction, processing, and use requires a great deal of energy and can create pollution. Resource

recovery is a practice that conserves natural resources by extracting used materials (e.g., paper, glass, and metals) and energy from municipal solid waste and reprocessing them for reuse. For example, a company can create plastic from oil, a virgin natural resource, or it can use recovered plastic from recycling programs. If a company uses recovered plastic, it is actually saving materials that would otherwise become waste, helping to prevent the depletion of natural resources, conserving energy, and preventing pollution that would have been created in the extraction and processing of oil from the ground.

In addition to the benefits already discussed, using recovered resources reduces threats to biodiversity. Natural resource extraction, along with other human activities, increases the rate at

Key Points

- Natural resources are vital to all forms of wildlife and the ecosystems in which they live.
- Human beings use natural resources for such modern conveniences as electricity, transportation, and industrial production, as well as basic survival.
- Rapid population growth, a higher standard of living, and technology all contribute to increased use of natural resources.
- Extracting, processing, and using natural resources can cause environmental problems, such as the disruption or destruction of ecosystems; a decrease in biodiversity; and land, water, and air pollution.
- Using renewable natural resources impacts the environment less than using nonrenewable resources because their supply can be regenerated.
- Using recovered resources prevents natural resources from being wasted.
- Using recovered rather than virgin resources decreases greenhouse gas buildup, which can result in global climate change.
- Resource recovery and conservation, as well as buying recycled products, are emerging trends that reduce consumption of natural resources.

which species of plants and animals are now vanishing. Diminishing the Earth's biodiversity has a substantial human cost because wild species and natural ecosystems are important resources. For example, some economists estimate that the lost pharmaceutical value from plant species extinctions in the United States

Biodiversity

Biodiversity refers to the variety of organisms that live on Earth. Supporting so many different organisms requires the conservation of the natural resources they need to survive. Using natural resources can not only deplete the Earth of the resources themselves, but by destroying critical **habitats**, it can also drive some species to extinction, ultimately reducing biodiversity.



alone is almost \$12 billion. Reducing the land disturbance and pollution associated with virgin materials extraction by using recovered materials, therefore, helps stop the degradation of the Earth's ecosystems.

Renewable Versus Nonrenewable Resources

Some natural resources are nonrenewable and some are renewable. **Nonrenewable resources** are those that become depleted more quickly than they naturally regenerate. One example of a nonrenewable resource is mineral ore. Once mined and used completely, it is gone forever, for all practical purposes, because it will take millions of years to regenerate.

Renewable resources can be replenished at approximately the same rate at which they are used (for example, sun and wind, which can be used to provide energy).

Products Made From Natural Resources

People use an abundance of resources to survive in a continually developing world. Globally, however, some people live simpler lifestyles than others and therefore use fewer resources. The following table lists some natural resources and the products and services people produce from them.

| Natural Resource | Product/Service |
|------------------|---|
| Trees | Paper, furniture, fuel |
| Cotton plant | Clothing |
| Oil/Petroleum | Plastic, fuel |
| Gas | Fuel |
| Coal | Fuel |
| Iron ore | Steel products (cans, bridges) |
| Bauxite ore | Aluminum products (cans, car parts) |
| Gold | Jewelry, dental material |
| Copper | Wire, coins, electrical equipment |
| Manganese | Steel, cast iron |
| Cobalt | Steel, jet engine parts, cutting tools |
| Platinum | Air pollution control and telecommunications equipment, jewelry |
| Chromium | Stainless steel, green glass, gems (rubies and emeralds), leather treatment |
| Diamonds | Jewelry, mechanical equipment |

Renewable or Nonrenewable—or Both?

Some resources can be considered both renewable and nonrenewable. Trees are considered a renewable resource because their supply can be replenished (e.g., more trees can be planted). If, however, an entire forest of 400-year-old trees is cleared and a new-growth forest is planted, the supply of old-growth trees has not been replenished. It takes many generations for an old-growth forest to mature, and so, old-growth trees are considered nonrenewable. Trees are a complex resource because as a forest, their environmental and economic contributions often depend on their age. For example, clearing a forest of 200-year-old Redwoods, unlike clearing a forest of new-growth pines, diminishes high levels of biodiversity only developed in old-growth forests.

What Are the Benefits of Natural Resources?

Renewable resources offer a number of environmental and economic benefits over nonrenewable resources. One obvious benefit is the infinite supply of renewable resources—they cannot be depleted. Another benefit of using renewable resources is self-reliance. A country that can provide its own renewable resource, such as solar-powered electricity, need not rely on other countries for an energy source. Additionally, renewable resources offer communities relief during periods of recovery from natural disasters. When communities lose standard services that require the use of natural resources (e.g., electric power or natural gas), renewable resources, such as wind and solar energy systems, are used to provide these services until the usual methods of achieving service can be restored. Following the 1992 Hurricane Andrew, for example, a south-Miami subdivision continued to have working streetlights because they were all photovoltaic (PV)-powered. The areas became neighborhood gathering spots for a community left without electricity following the storm. In several cases, homes equipped with PV systems were able to keep minimal services running and became emergency shelters for surrounding residents without power.

Greenhouse Gas: A gas that absorbs and retains heat from the sun. Greenhouse gases include methane, ammonia, sulfur dioxide, and certain chlorinated hydrocarbons. A buildup of these gases traps warmth in the Earth's atmosphere, changing the global climate.

Global Climate Change: Natural- or human-induced change in the average global temperature of the atmosphere near the Earth's surface.

What Are the Challenges of Using Natural Resources?

Extracting, processing, and using natural resources creates air, water, and land pollution, which can cause global environmental problems. For example, carbon dioxide, which is produced from deforestation, and from burning coal, oil, and natural gas, is a critical greenhouse gas. Many scientists believe that the buildup of greenhouse gases in the atmosphere can cause global climate change. Over time, this condition could pose serious dangers around the world, prompting such disasters as flooding, drought, and disease.

In addition, extracting and using resources can disturb relationships within ecosystems. For example, the effects of clearing an old-growth forest for wood can destroy habitats used by



What Are Ecosystems?

Ecosystems are self-regulating communities of plants and animals that interact with one another and with their nonliving environment. Examples of ecosystems include ponds, woodlots, and fields.

Organisms within an ecosystem are connected by energy. Individuals in a community feed on each other, thus transferring energy along a food chain or food web. In a food chain, energy is transferred from one organism to another in a linear form. For example, the sun provides fuel for a fig tree, which provides sustenance for wasps. The wasps are a food source for spiders, which are eaten by birds. More complex food webs can be thought of as a network, involving energy transfers among several organisms.

many animals, forcing them to find homes elsewhere. If these animals leave an ecosystem, further disturbances can occur within plant and animal populations that depend on these species.

Additionally, with the absence of tall trees in the forest, lower vegetation would lose shade provided by the upper canopy, resulting in increased exposure to sunlight and decreased moisture. Changes in an ecosystem's climatic conditions will eventually change vegetation type, which will alter the kinds of animals that can exist in that community. Over time, if enough ecosystems are affected, an entire community type can change (e.g., over-harvested fields can turn into deserts).



Population growth, increasing affluence, technological change, and urbanization are all responsible for rapidly rising resource consumption all over the world. The relationship between the population growth and increased resource use varies among developed and

undeveloped nations. For example, according to the Department of Energy, residents of the industrialized world comprise only 20 percent of the world's population, yet consume 86 percent of its iron and steel, and 76 percent of its timber. Despite the inconsistent relationship between resource use and developed and undeveloped nations, it is apparent that worldwide, more people use more resources. With population, technology, and lifestyle demands growing exponentially, people are using increasing amounts of many natural resources.

Natural Resource Consumption Facts

- The United States uses one million gallons of oil every 2 minutes.
- Every American uses about 47,000 pounds of newly mined materials each year.
- A television requires 35 different minerals, and more than 30 minerals are needed to make a computer.
- Over the past 40 years, global consumption of wood as industrial fuel rose by nearly 80 percent. North America alone accounts for about 40 percent of both production and consumption of wood as industrial wood products.
- In 1998, each person in the United States threw away an average of 4.46 pounds of waste each day.

(Sources: Natural Resources Defense Council, 1996; National Mining Association, 2000; World Resources Institute, 2000; EPA, 1998.)

Innovative Technology Using Recovered Materials

Plastic lumber was developed to utilize low-cost materials such as plastic grocery bags and wood chips or sawdust. Used as a wood alternative, plastic lumber offers several advantages over using lumber; it is long lasting, requires limited upkeep, and resists warping and decay. One example of how using plastic lumber can conserve and recover resources is a bridge at Ft. Leonard Wood, Missouri. The construction of the plastic lumber bridge utilized 13,000 pounds of mixed plastics that otherwise would have gone to waste. This exercise in reuse translates into significant natural resource conservation.

Emerging Trends

Increasing demands for natural resources have spurred new methods for conserving existing resources. More and more companies are developing new and innovative technologies that use recycled materials as raw materials in the manufacture of products. Some steel producers, for example, use minimills and a manufacturing process that uses virtually 100 percent recovered scrap steel as the raw material.

Recovery—In Action

- More than 65 percent of the steel produced in the United States is made from recovered steel.
- The average aluminum can contains an average of 50 percent post-consumer recycled content.
- By 1997, the paper industry relied on recovered paper for 45 percent of its feedstock.
- Using recovered aluminum cans saves 95 percent of the energy required to make the same amount of aluminum from bauxite, its virgin source.
- Recycling and reuse of 2,000 pounds of paper saves 7,000 gallons of water and 380 gallons of oil.

(Sources: Steel Recycling Institute, 2000; Aluminum Association, 2000; American Forest and Paper Association, 2000; The Can Manufacturers Institute, 1997; Weyerhaeuser Company, 1999.)

How Can You Help?

An increasing number of individuals are also practicing conservation methods by using less—such as buying products with less packaging. (See the Teacher Fact Sheets titled *Recycling* on pg. 73 and *Buying Recycled* on page 79). Certain lifestyle changes, such as composting food scraps rather than buying fertilizer (see the Teacher Fact Sheets titled *Source Reduction* on pg. 133 and *Composting* on page 109), also preserve natural resources. Other suggestions

for ways to practice conservation of natural resources are as follows:

- Reduce waste by reusing paper grocery and lunch bags or eliminate waste by using cloth bags.
- Donate old toys, clothes, furniture, cars, and other items to organizations such as the Salvation Army rather than throwing them in the garbage.
- Close the recycling loop by purchasing recycled-content products and packaging.

Additional Information Resources:

Visit the following Web sites for more information on natural resources and solid waste:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA Office of Solid Waste composting site: <www.epa.gov/epaoswer/non-hw/compost/index.htm>
- World Resources Institute: <www.wri.org>
- Natural Resources Defense Council: <www.nrdc.org>
- United States Department of Energy's National Renewable Energy Laboratory: <www.nrel.gov>
- United States Department of Energy's Center of Excellence for Sustainable Development: <www.sustainable.doe.gov>

To order the following document on municipal solid waste, call EPA toll-free at 800 424-9346 (TDD 800 553-7672) or look on the EPA Web site <www.epa.gov/epaoswer/osw/publicat.htm>.

- *A Collection of Solid Waste Resources*—CD-ROM